

## CRIME SCENE INVESTIGATIONS

# Capture the Crime Scene

Investigators are documenting crime scenes quicker and more accurately. New tech looks to push that even further with more complete evidence and to aid investigation workflow.

by Robert Galvin



■ The crime scene recreation image shows 3ds Max software with the point cloud being created with a FARO Laser Scanner and processed in FARO SCENE software.

Every crime scene is somewhat like a DNA sample—unique and different from any other. The challenges of documenting these crime scenes remain similar for most cases and most law enforcement agencies:

- Time limitations (especially for crash scenes)
- Possible disruption of the scene and its evidence
- Overlooked evidence in some instances
- The physical scope of the scene to be mapped, which many times can be large and complex

This last point is particularly challenging, therefore, choosing the most effective scene documentation tool is essential. Tape measurements, total stations, and photogrammetry were once popular and reliable ways to document crime scenes. Their effectiveness, however, relied heavily on the investigator's intuition as to what evidence was important to capture.

With time, solutions have been developed to alleviate these problems. 3D scanning is one such solution that has been steadily adopted by many law enforcement agencies.

The investigator using a laser scanner does not need to determine what evidence to capture because the scanner grabs the entire scene. One of this technology's most notable benefits is how little time it takes to scan a scene and document it completely. In just a few scanner setups at different locales in a scene, the scanner can capture millions of evidence data points that form a photographic point cloud.

### Gives more evidence in shorter time

Tom Morris, an on-call crash reconstruction consultant to the St. Louis Traffic Accident Reconstruction Unit, feels that 3D laser scanning is the right tool at the right time. "With the laser scanner, I can document more information more completely in a smaller amount of time," Morris says. Other tools he has used, such

as a total station, take too much time. "As it takes time, this limits what I can get done in a year's time because I can only work on a certain number of cases per year." Morris likes being able to collect more evidence at a scene quickly with the scanner while also preserving the scene as it is. "You can do an analysis on that crime scene while you're no longer at the scene," Morris added.

The laser scanner is just one component of 3D scene documentation. The other critical component is software that will transform the point cloud of scene data into a useful 3D diagram or model. "It's the ability to see things in a 3D environment and work with them in that environment," Morris continues. "This makes the process of 3D scene reconstruction easier because other software programs only allow you to create a scene in 2D, then switch to 3D. We don't want the software to be a limiting factor as to what information we can capture."

Det. Joe Swenson, Clark County Sheriff's Major Crimes Unit, Wash., has seen big advantages with using his FARO

Focus<sup>3D</sup> S 120 Laser Scanner as he integrates it into his workflow for crime scene investigations. After marking evidence items such as bullet cartridge casings, knife, gun, and blood stains, he records these on video. If bullet trajectories are present, they can be scanned using rods and spheres to accurately determine the angles of the trajectories.

Next, Swenson scans for more in-depth evidence since not all scene evidence details are immediately apparent. “When a body is removed, it’s not uncommon to find other items of evidence underneath the body that are important,” Swenson says. “People get shot; they fall down on cartridge cases. So, it’s nice to have those items in the scan, too.”

### Software aids with mobile scanning

The FARO Focus Laser Scanner is specially designed for outdoor applications such as crash and crime scenes due to its small size, light weight, and long range—up to 350 meters (1,148 feet)—extended scanning possibilities, even in direct sunlight, and easy positioning with the integrated GPS receiver. Remote scanning with the Focus Laser Scanner and almost limitless scan data sharing makes this solution conveniently mobile.

Swenson cited another benefit with his laser scanner once scan data is loaded into the diagramming software. “I can get a top-down view and can start tracing specific items such as outlines of buildings or placement of vehicles,” the detective says. “It’s much more accurate for me, much quicker, and looks more professional.”

### Large scenes scan easier

For Det. Sgt. David DeLeeuw with the Ocean County, N.J., Sheriff’s Office, the most challenging scenes are when he has to combine both indoor and outdoor scenes together. Each scene dictates where and how he sets up his equipment, which in this case includes a Leica Geosystems ScanStation PS40. “If I’m working a homicide, I typically try to start within the area of the victim(s) and work in an outward manner,” DeLeeuw says. “This allows me to

## The Bigger Picture: How Drones are Reshaping Crime Scene Documentation

As 3D laser scanning grows in law enforcement, another mapping method is proving equally compelling and integrates seamlessly with scanning data: drones.

For one recent shooting incident, Visual Law, a San Jose, Calif.-based firm specializing in forensic scene visualization and documentation, documented scene details with the highest level of fidelity and scope by combining data collected by both a 3D laser scanner and a drone capable of taking an image grid of the scene that was processed to create a 3D point cloud using specialized photogrammetry software.

On Feb. 21, 2014, two San Jose State University police officers confronted a man carrying a saw blade as he walked on a sidewalk near the campus. The officers used a taser to subdue the man, but when this did not deter him as he kept advancing, they shot the man twice, killing him. One officer wore a shoulder-mounted body camera that recorded the events. Because body-worn camera footage can be misleading due to perceived distances for persons and objects captured within the field of view, Visual Law used a FARO Focus Laser Scanner and DJI Inspire 1 drone to replicate the entire shooting scene. Next, the firm used the scanner to determine the optics of the body camera lens to build a “virtual” camera. This virtual camera was used to reverse engineer the body camera position within the shooting scene for each frame of footage. Photos of the scene from all directions were used to pinpoint key landmarks and shadows cast by overhead lines, roof edges and poles to help establish time of events shown with the body camera.

Once the scene was laser scanned, the drone was used to photogrammetrically produce a point cloud of a larger portion of the scene. “That far-distant 3D data the drone provides...when married to the high resolution data captured by the scanner gives a really powerful replication of the scene,” says Mark Johnson, Visual Law’s creative director and forensic graphic supervisor. In the Lopez shooting case, Johnson was able to laser scan the scene on both sides of a city block with his Faro scanner, yet could not acquire within the time allotted at the scene a number of telephone poles, rooftops and other distant objects needed to align and cross-reference photos taken at the shooting scene. “But the drone was able to do this, with one flight and one battery,” Johnson says. “By combining data gathered with the scanner and drone, we were able to produce a complete scene that leverages the advantages of both approaches.”

document and preserve the positioning of the victim(s) and allow for my other detectives to begin examining the body. I can then focus on documenting the rest of the scene while they are conducting the examination.”

When a shooting incident has occurred and a projectile strikes multiple objects such as a vehicle, wall, window, person or house, the investigator will want to document the path that the projectile took, DeLeeuw says. “This could be a very large scene to document. The range and accuracy of the Leica PS40 allows us to document these large scenes with minimal setups.”

He says the new Leica scanner has significantly improved scene documentation workflow, and added that a big benefit is the scanner’s ability to scan in any type of weather. For example, shortly after acquiring the scanner, DeLeeuw and other investigators were called to an officer-involved shooting. En route to the scene, it began raining hard, which worried the investigators since scene evidence needed to be documented and preserved. When they arrived at the scene, they deployed the scanner. “The scanner worked flawlessly in the rain, and while I was scanning I was able to remotely monitor



■ Objectively capture entire crime or crash scenes in 360 degrees, and bring the facts of the scene to life with supporting multimedia evidence files.

the scanner progress from my phone without being subjected to the rain,” DeLeeuw notes. “We were done documenting the scene in less than an hour and the data we captured was crystal clear. We could never do this with our prior documentation methods,” DeLeeuw adds.

### 360-degree solution gives panoramic view of scene

Factually and visually conveying what happened in a crime or crash scene is vital, and so is having the right technology to do so. Victor, N.Y.-based L-Tron Corporation introduced OSCR360, a new way for capturing and presenting crime and crash scenes. It’s a solution that includes a camera and tripod for shooting panoramic, 360-degree photos, as well as a tablet for real-time photo viewing, carrying case and OSCR software.

The most innovative feature of OSCR360 is its ability to give a virtual presentation of a crime or crash scene using 360-degree placement photos. According to Dick McEvoy, president of Forensic Imaging Inc., with the OSCR360, “You are not only capturing 360-degree photos, but you are capturing geospatial relationships and a sense of scale that are not found with traditional still photos. You can relate to where things are in the scene from the photos you take.” One example

of how the new product works is if a police department raids a house containing 60 pounds of cocaine. Instead of showing 60 individual still photos of one-pound bags of the drug scattered throughout the scene as evidence, a single OSCR360 panoramic photo will show the magnitude of how much 60 pounds of cocaine really is and where it was found in the scene.

OSCR360 is also the container for multi-media evidence. Multi-media files including body-worn camera footage, dashcam or cell phone videos, audio recordings, 911 calls, as well as close-up still photos of evidence can be placed into OSCR360. “You will be able to show people the evidence through a panoramic view and tie in other evidence,” McEvoy says. “This means you can bring the visual scene to juries as it was captured instead of verbally describing it.”

### Getting close-up details

Crime scene investigations don’t always involve specific scenes such as shooting scenes or vehicle crash sites. Anthony Giamberdino, crime scene investigator (CSI) and detective with Niagara County Sheriff’s Office, N.Y., has used scanning for capturing close-up details of homicide victims in autopsies. The CSI has scanned bodies of shaken baby cases as well as of adults. “As a crime scene investigator, you photograph

people’s injuries,” Giamberdino explains. “But you don’t always see the injuries. When medical examiners peel away skin, they can find previous injuries or injuries that are healing, like broken ribs. As they’re doing this, I can rescan them,” Giamberdino continues. “This gives us another opportunity to secure evidence.”

Giamberdino has used a FARO Freestyle3D X handheld scanner to scan bodies in autopsies with high success. He uses the handheld scanner for one to two minutes to capture what he needs from a body, and also takes photos. “I can put hyperlinks in and attach the photos to a point in the scan,” says Giamberdino. With the 3D scan completed, he says, “I can put a link to, say, a rib area [and] can click and bring up a close-up view of this scanned area. In this way, I can tell the story of the crime better.”

The FARO Freestyle3D X scanner is also effective for mapping bullet trajectory. If a shooting victim is lying on the ground with a gunshot wound, and with a trajectory line coming out of the body, Giamberdino can scan it. “Then we could scan the crime scene with a FARO Focus Laser Scanner, and I can combine the scans, and, by using the FARO SCENE software, place the shooting victim vertically to get a trajectory line.”

Giamberdino sees opportunities to use the handheld scanner for homicides, police-involved shootings, and all accident scenes. “We can scan close-up views of car interiors, air bag deployment, and more,” he says.

Scene documentation is critical and using technology such as 3D scanning allows investigators to capture more evidence, more quickly while still preserving the scene. **LET**

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